

◆ **Skill B** Finding interest compounded continuously

**Recall** If the principal,  $P$ , is invested at an annual interest rate of  $r$ , compounded continuously, the amount,  $A$ , in the investment after  $t$  years is  $A = Pe^{rt}$ .

◆ **Example 1**

Find the amount in an account if \$1500 is invested at an annual rate of 5.8% and interest is compounded continuously for 7 years.

◆ **Solution**

$$A = Pe^{rt}$$

$$A = 1500e^{(0.058)(7)} \qquad 5.8\% = 0.058$$

$$A = \$2251.20 \qquad \text{Use a calculator.}$$

◆ **Example 2**

How long will it take to double your money if you deposit \$500 at an annual rate of 7.2% compounded continuously?

◆ **Solution**

$$A = Pe^{rt}$$

$$1000 = 500e^{(0.072)t} \qquad \$500 \text{ doubles to } \$1000$$

$$2 = e^{(0.072)t} \qquad \text{Divide each side by 500.}$$

$$\ln 2 = \ln e^{(0.072)t} \qquad \text{Take the natural logarithm of each side.}$$

$$\ln 2 = 0.072t \qquad \text{inverse functions: } \ln e^x = x$$

$$t = \frac{\ln 2}{0.072}$$

$$t \approx 9.63$$

It will take about 9 years and 7.5 months to double your money.

**Find the amount,  $A$ , by using the formula  $A = Pe^{rt}$  for continuously compounded interest.**

13. \$1000 at 4% for 10 years      14. \$800 at 7% for 3 years      15. \$2500 at 5.2% for 6 years

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16. \$10,000 at 12% for 10 years      17. \$8000 at 8.9% for 2 years      18. \$50,000 at 15% for 7 years

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19. How long will it take to double your money if you deposit \$1200 at an annual rate of 6.9% compounded continuously? \_\_\_\_\_

20. How long will it take to triple your money if you deposit \$2000 at an annual rate of 8.5% compounded continuously? \_\_\_\_\_

21. **INVESTMENTS** Armando invests \$10,000 at an interest rate of 7.75%. If the interest is compounded continuously, and no additional deposits or withdrawals are made, how much is the account worth after 10 years? \_\_\_\_\_

22. \$1000 is deposited in an account with an interest rate of 6.5%. Interest is compounded continuously, and no deposits or withdrawals are made. Find the amount in the account at the end of three years. \_\_\_\_\_

23. The amount of radioactive carbon-14 remaining after  $t$  years is given by the formula  $N(t) = N_0e^{-0.00012t}$ . How much of a 20 milligram sample will remain after 50 years? \_\_\_\_\_

7. A certain population of bacteria doubles every 3 weeks. The number of bacteria in the population is now  $N_0$ . Find its size in:
- a. 6 weeks                      b. 15 weeks                      c.  $W$  weeks
8. A culture of yeast doubles in size every 20 min. The size of the culture is now  $N_0$ . Find its size in:
- a. 1 hour                      b. 12 hours                      c. 1 day
9. The half-life of carbon-14 is approximately 6000 years. Determine how much of 100 kg of this substance will remain after:
- a. 12,000 years                      b. 24,000 years                      c.  $y$  years
10. The radioactive gas radon has a half-life of approximately  $3\frac{1}{2}$  days. About how much of a 100 g sample will remain after 1 week?